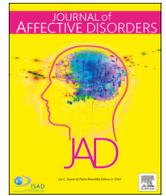




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Research paper

The impact of COVID-19 pandemic on mental health & wellbeing among home-quarantined Bangladeshi students: A cross-sectional pilot study



Abid Hasan Khan^a, Mst. Sadia Sultana^a, Sahadat Hossain^{a,*}, M. Tasdik Hasan^b, Helal Uddin Ahmed^c, Md. Tajuddin Sikder^a

^a Department of Public Health and Informatics, Jahangirnagar University, Savar, Dhaka, Bangladesh

^b Department of Primary Care & Mental Health, University of Liverpool, United Kingdom

^c National Institute of Mental Health, Sher-E-Bangla Nagar, Dhaka, Bangladesh

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ABSTRACT

Background: COVID-19 is imposing threat both on physical and mental health since its outbreak. Bangladesh adopted lockdown strategy with potential consequences on day to day life, mental and physical health and this study aims to explore the impact of COVID-19 on mental health and wellbeing among Bangladeshi students.

Methods: A cross-sectional study was conducted between 9th and 23rd April 2020 among 505 college and university students. Data was collected by using online questionnaire including DASS 21 and IES. Descriptive analysis and bivariate linear regression were performed to examine the association of variables.

Results: 28.5 % of the respondents had stress, 33.3% anxiety, 46.92% depression from mild to extremely severe, according to DASS 21 and 69.31% had event-specific distress from mild to severe in terms of severity according to IES. Perceiving physical symptoms as COVID-19 was significantly associated with DASS stress subscale ($B = 3.71$, 95% CI: 1.01 to 6.40), DASS anxiety subscale ($B = 3.95$, 95% CI: 1.95 to 5.96), DASS depression subscale ($B = 3.82$, 95% CI: 0.97 to 6.67) and IES scale ($B = 7.52$, 95% CI: 3.58 to 11.45). Additionally, fear of infection, financial uncertainty, inadequate food supply, absence of physical exercise and limited or no recreational activity had significant association with stress, anxiety, depression and post-traumatic symptoms.

Conclusion: This COVID-19 outbreak imposes psychological consequences on people to a great extent which requires attention from the concerned authorities to cope with this situation mentally. The perception about the outbreak can also play a big role in psychological impact.

1. Background

The COVID-19, recent public health crisis of global concern is challenging psychological capacity of the public to deal with ongoing crisis (Wang et al., 2020). This is not applicable to individuals with COVID-19 only but also those who are bound to be in quarantine for a long time during a lockdown. World Health Organization (WHO) declared the emergence of novel coronavirus as global public health emergency of on 30th January, 2020 (WHO, 2020b, 2020c) whilst Institution of Epidemiology, Disease Control and Research (IEDCR), declared the first confirmed case of COVID-19 in Bangladesh on 8th March, 2020 (Hossain et al., 2020). The situation is worsening since then. As of 9th August, 2020, the virus infected 257,600 people nationwide (IEDCR, 2020). The pandemic is not only causing deaths worldwide but also creating psychological pressure for persons with COVID-19 and healthy individuals (Duan and Zhu, 2020). High level of

stress and anxiety are natural responses towards any sorts of unnatural situation (Royand Tripathy, 2020).

Quarantine has been used as a preventive measure for centuries to deal with major infectious outbreaks and it proved to be effective in controlling the spread of infectious diseases such as cholera and plague in the past (Brooks et al., 2020; Twu et al., 2003; Mandavilli, 2003; Barbera et al., 2001). Quarantine is the separation and restriction of movement of people who have potentially been exposed to a contagious disease to ascertain if they become unwell, for reducing the risk of them infecting others in the community (CDC, 2017). Bangladesh government suspended all educational institutions to function since 18th March and imposed lockdown to restrict public gathering and to encourage staying home since 26th March to prevent the rapid spread of COVID-19 infection (The Daily Star, 2020). Following this procedure people are bound to be home quarantined for the protection of community. This method, in Bangladesh, may succeed or not, but long

* Corresponding author.

E-mail address: sahadat.hossain@juniv.edu (S. Hossain).

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lockdown period forcing mass quarantine is sure to affect people psychologically with underlying causes such as increased media reporting, escalating number of new cases etc. (Rubin and Wessely, 2020). Another study provides evidence for individuals being in quarantine may experience psychological distress in the form of anxiety, anger, confusion and post-traumatic stress symptoms (Brooks et al., 2020).

Strategies for managing students to effectively and suitably control their feelings during general wellbeing crises and stay away from misfortunes brought about by emergency occasions have become a pressing issue for college and universities (Cao et al., 2020). As of March 25, 2020, 150 nations have shut schools and educational institutes across the country, either postponing or prohibiting campus activities, affecting over 80% of the world's student population (Sahu, 2020). The high pervasiveness of mental consequences in university students has been often notified in different studies conducted on Bangladeshi students (Cao et al., 2020; Hossain et al., 2020; Anjum et al., 2019; Mamun et al., 2019). According to YoungMinds survey, 83% young people think that their already existent mental health conditions got worse as the result of suspension on educational activities along with loss of routine and limited social communication (YoungMinds, 2020). Approximately one out of every four students suffer from anxiety (Cao et al., 2020) and about 60% of the students seemed to have moderate to severe IES score (Odriozola-González, et al., 2020).

Based on the set of evidence, there are reasons to explore the mental health of Bangladeshi home quarantined students during this outbreak. There's a pressing need to grasp the impacts of this worldwide unprecedented pandemic on mental health. It is more true in low- and middle-income countries (LMICs), such as Bangladesh, which have a limited resource to tackle both COVID-19 and the various mental health issues that emerge from the outbreak. There have been studies of the epidemic's psychological effects on the general population, doctors, medical professionals, children and older adults (Chen et al., 2020; Yang et al., 2020; J. Li et al., 2020; S. W. Li et al., 2020). But, there is a paucity of research that evaluated the mental health concerns during this pandemic, especially in Bangladesh among home quarantined students. Hopefully, this study will fill that gap by providing suitable information to ensure a COVID-19 free society and tackling any future pandemic situations. Therefore, this pilot study aimed to assess the level of psychological impact of college and university students who are bound to be home-quarantined as widespread lockdown started to take place.

2. Methods

2.1. Study design and participants

A cross-sectional study design was adopted. Being a student of college or university, being home-quarantined, able to speak Bengali and have been residing in Bangladesh during the outbreak were the eligibility criteria for this study.

2.2. Procedure

The survey was completed by participants from 9th April to 23rd April, 2020. Convenience sampling method was applied for data collection via social media with an online questionnaire including DASS 21 and IES as face to face interview had to be avoided considering ongoing health threat. The survey link was disseminated in various college and university student platforms available on social media (e.g. Facebook). It was totally voluntary in nature and participant could withdraw from the survey at any time without providing any justification. After going through the aims and purpose of the study, respondents provided their informed consent prior to starting the investigation and completed a self-reporting questionnaire. A total 509 respondents completed the survey and 505 respondents were taken for final analysis. 4 data were discarded considering incomplete submission. No financial incentive

was provided to the participants and anonymity was maintained to ensure the confidentiality and reliability of data. This study was conducted online in full compliance with the provisions of the Declaration of Helsinki regarding research on human participants.

2.3. Measures

2.3.1. Socio-demographics

Socio-demographic data of the respondents was obtained through both open and close ended questions involving their age, gender, religion, educational attainment, marital status and number of family members.

2.3.2. Self-reported physical symptoms

Information on physical symptoms were obtained through questions including concerned symptoms to be answered only in "Yes" or "No". Concerned physical symptoms were chosen on the basis of closeness towards the symptoms of COVID-19 such as fever, difficulty breathing, dry cough and other symptoms like fatigue, diarrhea and sore throat. The respondents were also asked if they perceived the symptoms they have as a sign of COVID-19 infection.

2.3.3. Home-quarantine activities and COVID-19 related social stressors perceived as psychological discomfort

Respondent activities during this quarantine or lockdown period and COVID-19 related social stressors they perceived to be psychologically uncomfortable were obtained using a checklist for each section. Quarantine activity checklist had options such as online social networking, recreational activity (e.g. entertainment show), physical exercise, religious activity, educational activity and a scope to mention any other activities apart from the ones mentioned above. COVID-19 related social stressors checklist had options such as prolonged home-quarantine, financial uncertainty, inadequate food supply, inadequate valid information on COVID-19, fear of infection and excessive exposure to the news of outbreak & death on social media.

2.3.4. Stress, anxiety and depression

Depression Anxiety and Stress Scale 21 (Lovibond and Lovibond, 1995) was used to assess the prevalence of stress, anxiety and depression among students. The scale is also validated in Bangla (Alim et al., 2017). The scale contains 21 items divided equally with 7 items into 3 subscales of stress, anxiety and depression. Total score from each subsection can range from normal to extremely severe. The students responded to the items on a 4-point Likert scale (0 = never a problem, 1 = sometimes a problem, 2 = often a problem, and 3 = almost always a problem).

Example items include "I found it hard to wind down" (stress), "I was aware of dryness of my mouth" (anxiety), "I couldn't seem to experience any positive feeling at all" (depression).

2.3.5. Event-specific distress (ESD)

Impact of Event Scale (Horowitz et al., 1979) was used to evaluate event-specific distress (Cronbach's alpha = 0.86). It is a 15 item self-reporting assessment tool for measuring amount of distress associated with specific events. The frequency of each item is rated on a 4-point scale: 0 (not at all), 1 (rarely), 3 (sometimes), or 5 (often). The highest possible total score on the IES is 75 (Zhang and Ma, 2020).

Example items include 'I had trouble falling asleep or staying asleep, because of pictures or thoughts about it that came into my mind' (intrusion) and 'I stayed away from reminders of it' (avoidance).

This scale was previously used in China during COVID-19 outbreak (Zhang and Ma, 2020), in Singapore during SARS outbreak (Tham et al., 2005) and in India as well (Prashanth et al., 2015).

Table 1
Association among sociodemographic variables and mental health impact.

Variables	n (%) (N = 505)	Stress			Anxiety			Depression			ESD		
		R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)
Age (years)													
25 or more	45 (8.91%)	0.003	-0.001	0.19 (-0.21-0.60)	0.006	0.002	0.34 (-0.13-0.80)	0.001	-0.003	0.19 (-0.32-0.70)	0.022	0.018	0.53** (0.21-0.84)
20-24	396 (78.42%)			0.16 (-0.12-0.43)			0.26 (-0.06-0.58)			0.08 (-0.26-0.44)			0.28* (0.06-0.50)
19 or less	64 (12.67%)			Ref.			Ref.			Ref.			Ref.
Gender													
Male	317 (62.77%)	0.001	-0.001	-0.07 (-0.25-0.12)	0.005	0.003	-0.17 (-0.39 - 0.05)	0.003	0.001	-0.15 (-0.39-0.09)	0.005	0.003	-0.12 (-0.27-0.03)
Female	188 (37.23%)			Ref.			Ref.			Ref.			Ref.
Educational Institute													
University	434 (85.94%)	0.010	0.008	2.61* (0.29-4.93)	0.004	0.002	1.18 (-0.56-2.93)	0.005	0.003	2.001 (-0.46-4.46)	0.011	0.009	4.07* (0.67-7.48)
College	71 (14.06%)			Ref.			Ref.			Ref.			Ref.
Marital Status													
Unmarried	488 (96.63%)	0.004	0.002	-0.36 (-0.90-0.14)	0.0001	-0.002	-0.06 (-0.65-0.53)	0.001	-0.001	-0.23 (-0.88-0.41)	0.003	0.001	-0.26 (-0.66-0.15)
Married	17 (3.37%)			Ref.			Ref.			Ref.			Ref.
Number of family members													
>7	28 (5.54%)			-0.03 (-0.71-0.11)			0.08 (-0.39-0.56)			-0.05 (-0.57 -0.47)			0.06 (-0.27-0.39)
5-7	217 (42.97%)			-0.11 (-0.30-0.07)			-0.12 (-0.34-0.10)			-0.20 (-0.44-0.04)			-0.06 (-0.21-0.09)
<5	260 (51.49%)	0.006	0.002	Ref.	0.003	-0.001	Ref.	0.005	0.001	Ref.	0.002	-0.002	Ref.

* P-value < .05,

** P-value < .01

B = Beta, R² = R-squared, AR² = Adjusted R-squared, CI = Confidence interval

2.4. Statistical analysis

Descriptive analysis was conducted to obtain the characteristics of the participants. Bivariate linear regression was performed to predict the association of psychological measures (DASS subscale scores and IES score) to potential risk factors. The estimates of the strengths of associations were demonstrated by the Beta (Co-efficient) with a 95% confidence interval (CI). A p-value of ≤ 0.05 was considered to be significant. The STATA version 14.1 (StataCorp LP, College Station, TX, USA) and MS Excel were used to carry out all statistical analysis.

3. Results

3.1. Sociodemographic variables and mental health impact

Sociodemographic variables are reported in Table 1. Most of the respondents were male (62.77%), aged 20 to 24 years (78.42%), unmarried (96.63%). Majority (85.9%) respondents were attending at a university. Most of the respondents lived in a family of less than 5 members (51.49%). Age group 20 to 24 was significantly associated with higher IES score (B = 0.28, 95% CI: 0.06 to 0.50), but age group 25 or more had significant association with even higher IES score (B = 0.53, 95% CI: 0.21 to 0.84). Students studying in university had significant association with higher DASS stress subscale (B = 2.61, 95% CI: 0.29 to 4.93) and IES scores (B = 4.07, 95% CI: 0.67 to 7.48). Other sociodemographic variables including gender, marital status family size had no significant association with higher or lower IES and also any of DASS subscale scores.

3.2. Perceived COVID-19 symptoms and mental health impact

Perceived COVID-19 symptoms are reported in Table 2. Most reported symptom was dry cough (13.66%) and was significantly associated with higher scores in DASS stress subscale (B = 2.69, 95% CI: 0.34 to 5.04) and DASS anxiety subscale scores (B = 2.21, 95% CI: 0.45

to 3.97). Later comes fatigue (13.47%) that is significantly associated with higher score in DASS stress subscale (B = 7.09, 95% CI: 4.79 to 9.38), DASS anxiety subscale (B = 5.40, 95% CI: 3.68 to 7.11) and DASS depression subscale (B = 7.14, 95% CI: 4.70 to 9.57). Fever (8.32%) had significant association with increased score of DASS stress subscale (B = 3.98, 95% CI: 1.06-6.90) and DASS anxiety subscale scores (B = 4.04, 95% CI: 1.87 to 6.21). Throat pain (6.34%) was significantly associated with higher DASS anxiety subscale scores (B = 3.96, 95% CI: 1.48 to 6.42). Difficulty breathing (4.36%) had significant relationship with higher scores DASS stress subscale (B = 6.03, 95% CI: 2.09 to 9.68), DASS anxiety subscale (B = 9.02, 95% CI: 6.15 to 11.89) and DASS depression subscale (B = 5.47, 95% CI: 1.30 to 9.64). And perceiving these physical symptoms as COVID-19 had significant association with higher scores in DASS stress subscale (B = 3.71, 95% CI: 1.01 to 6.40), DASS anxiety subscale (B = 3.95, 95% CI: 1.95 to 5.96), DASS depression subscale (B = 3.82, 95% CI: 0.97 to 6.67) and IES scores (B = 7.52, 95% CI: 3.58 to 11.45).

3.3. Home-quarantine activities and mental health impact

In Table 3, Recreational activity (e.g. watching TV series, reading story books, online and offline gaming etc.) had significant association with lower scores in DASS stress subscale (B = -1.65, 95% CI: -3.27 to -0.003) and DASS anxiety subscale (B = -1.27, 95% CI: -2.49 to -0.06). Physical exercise was significantly associated in lowering scores of DASS depression subscale (B = -2.10, 95% CI: -4.02 to -0.17). Similarly, household chores had significant association with lower DASS depression subscale scores (B = -1.76, 95% CI: -3.48 to -0.04). Other activities including Social networking and educational activities were not significantly associated with IES or any of DASS subscale scores.

3.4. Perceived COVID-19 related social stressors and mental health impact

In Table 4, COVID-19 related social stressors to affect the respondents' mental health were reported. Financial uncertainty had

Table 2
Association among perceived COVID-19 symptoms and mental health impact.

Symptoms	n (%) (N = 505)	Stress			Anxiety			Depression			ESD		
		R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)
Fever													
Yes	42 (8.32%)	0.014	0.012	3.98** (1.06-6.90)	0.026	0.024	4.04** (1.87-6.21)	0.006	0.004	2.79 (-0.30-5.89)	0.001	-0.001	1.62 (-2.69 – 5.93)
No	463 (91.68%)			Ref.			Ref.			Ref.			Ref.
Dry cough													
Yes	69 (13.66%)	0.010	0.008	2.69* (0.34-5.04)	0.012	0.010	2.21* (0.45-3.97)	0.001	-0.001	0.76 (-1.74-3.26)	0.001	-0.001	1.03 (-2.45 – 4.49)
No	436 (86.34%)			Ref.			Ref.			Ref.			Ref.
Fatigue													
Yes	68 (13.47%)	0.068	0.066	7.09** (4.79-9.38)	0.071	0.069	5.40** (3.68 – 7.11)	0.062	0.060	7.14** (4.70-9.57)	0.001	-0.001	1.47 (-2.02 – 4.96)
No	437 (86.53%)			Ref.			Ref.			Ref.			Ref.
Sore throat													
Yes	32 (6.34%)	0.005	0.003	2.77 (-0.55 – 6.09)	0.019	0.017	3.96** (1.48 – 6.42)	<0.0001	-0.002	0.08 (-3.44-3.60)	0.0002	-0.002	-0.77 (5.66 – 4.12)
No	473 (93.66%)			Ref.			Ref.			Ref.			Ref.
Difficulty breathing													
Yes	22 (4.36%)	0.018	0.016	6.03** (2.09-9.68)	0.071	0.069	9.02** (6.15-11.89)	0.013	0.011	5.47* (1.30 – 9.64)	0.001	-0.001	1.97 (-3.87 – 7.80)
No	483 (95.64%)			Ref.			Ref.			Ref.			Ref.
Perceiving these symptoms as COVID-19													
Yes	50 (9.90%)	0.014	0.012	3.71** (1.01-6.40)	0.029	0.027	3.95** (1.95 – 5.96)	0.014	0.012	3.82** (0.97 – 6.67)	0.027	0.025	7.52** (3.58 – 11.45)
No	455 (90.10%)			Ref.			Ref.			Ref.			Ref.

* P-value < .05,

** P-value < .01

B = Beta, R² = R-squared, AR² = Adjusted R-squared, CI = Confidence interval

significant association with higher scores in DASS stress subscale (B = 3.67, 95% CI: 2.01 to 5.34), DASS anxiety subscale (B = 2.15, 95% CI: 0.89 to 3.40) and DASS depression subscale (B = 3.37, 95% CI: 1.60 to 5.13). Fear of infection had significant association with higher score in DASS anxiety subscale (B = 1.20, 95% CI: -0.01 to 2.410 and IES scale (B = 6.11, 95% CI: 3.79 to 8.43). Inadequate food supply had significant relationship with higher scores in DASS stress subscale (B = 2.94, 95% CI: 0.76 to 5.13), DASS anxiety subscale (B = 2.63,

95% CI: 1.00 to 4.26), DASS depression subscale (B = 2.95, 95% CI: 0.64 to 5.26) and IES scale (B = 5.63, 95% CI: 2.44 to 8.82). Inadequate valid information of COVID-19 had significant association with higher scores in IES scale (B = 2.83, 95% CI: 0.27 to 5.38). Exposure to COVID-19 news in social and mass media had significant association with higher scores in DASS stress subscale (B = 2.63, 95% CI: 0.97 to 4.28), DASS depression subscale (B = 2.68, 95% CI: 0.93 to 4.23) and IES scale (B = 5.21, 95% CI: 2.80 to 7.62). However, prolonged

Table 3
Association among home-quarantine activities and mental health impact.

Activities	n (%) (N = 505)	Stress			Anxiety			Depression			ESD		
		R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)
Online Social Networking													
Yes	467 (92.48%)	0.003	0.001	-1.89 (-4.96 – 1.18)	0.004	0.002	-1.62 (-3.94-0.67)	0.006	0.004	-2.97 (-6.21 – 0.27)	0.001	-0.001	-1.53 (-6.04 – 2.98)
No	38 (7.52%)			Ref.			Ref.			Ref.			Ref.
Recreational activity													
Yes	275 (54.46%)	0.008	0.006	-1.65* (-3.27 – -0.003)	0.008	0.006	-1.27* (-2.49 – -0.06)	0.0002	-0.002	-0.31 (-2.03 – 1.42)	0.0003	-0.002	-0.43 (-2.83 – 1.96)
No	230 (45.54%)			Ref.			Ref.			Ref.			Ref.
Physical exercise													
Yes	135 (26.73%)	0.004	0.002	-1.29 (-3.11 – 0.54)	0.001	-0.001	-0.55 (-1.92-0.82)	0.009	0.007	-2.10* (-4.02 – -0.17)	0.003	0.001	1.78 (-0.91 – 4.47)
No	370 (73.27%)			Ref.			Ref.			Ref.			Ref.
Household chores													
Yes	280 (55.45%)	0.0051	0.003	-1.33 (-2.96 – 0.29)	0.001	-0.002	-0.31 (-1.53-0.91)	0.008	0.006	-1.76* (-3.48 – -0.04)	0.003	0.001	1.50 (-0.89 – 3.89)
No	225 (44.55%)			Ref.			Ref.			Ref.			Ref.
Educational activities													
Yes	45 (8.91%)	0.003	0.001	1.88 (-0.97 – 4.72)	<0.001	-0.002	0.09 (-2.04 – 2.22)	0.0001	-0.002	0.28 (-2.73 – 3.29)	0.001	-0.001	-1.43 (-5.61 – 2.75)
No	460 (91.09%)			Ref.			Ref.			Ref.			Ref.

* P-value < .05,

**P-value < .01 B = Beta, R² = R-squared, AR² = Adjusted R-squared, CI = Confidence interval

Table 4
Association among perceived COVID-19 related social stressors and mental health impact.

Stressors	n (%) (N = 505)	Stress			Anxiety			Depression			ESD		
		R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)	R ²	AR ²	B(95% CI)
Prolonged home-quarantine													
Yes	339 (67.13%)	0.004	0.002	1.25 (-0.47 – 2.98) Ref.	<0.0001	-0.002	0.09 (-1.20 – 1.38) Ref.	0.003	0.001	1.17 (-0.65 – 2.99) Ref.	0.001	-0.001	1.03 (-1.51 – 3.56) Ref.
No	166 (32.87%)												
Financial Uncertainty													
Yes	180 (35.64%)	0.036	0.034	3.67** (2.01 – 5.34) Ref.	0.022	0.020	2.15** (0.89 – 3.40) Ref.	0.027	0.025	3.37** (1.60 – 5.13) Ref.	0.006	0.004	2.20 (-0.28 – 4.68) Ref.
No	325 (64.36%)												
Fear of infection													
Yes	257 (50.89%)	0.006	0.004	1.45 (-0.16 – 3.07) Ref.	0.008	0.006	1.20* (-0.01 – 2.41) Ref.	0.001	-0.001	0.73 (-0.99 – 2.44) Ref.	0.050	0.049	6.11** (3.79 – 8.43) Ref.
No	248 (49.11%)												
Inadequate food supply													
Yes	82 (16.24%)	0.014	0.012	2.94** (0.76 – 5.13) Ref.	0.020	0.018	2.63** (1.00 – 4.26) Ref.	0.012	0.010	2.95** (0.64 – 5.26) Ref.	0.023	0.021	5.63** (2.44 – 8.82) Ref.
No	423 (83.76%)												
Inadequate valid information on COVID-19													
Yes	159 (31.49%)	0.001	-0.001	0.64 (-1.10 – 2.39) Ref.	0.001	-0.001	0.42 (-0.89 – 1.72) Ref.	0.002	-0.001	0.81 (-1.03 – 2.66) Ref.	0.009	0.007	2.83* (0.27 – 5.38) Ref.
No	346 (68.51%)												
Exposure to COVID-19 news on social & mass media													
Yes	193 (38.22%)	0.019	0.017	2.63** (0.97 – 4.28) Ref.	0.006	0.004	1.10 (-0.14 – 2.35) Ref.	0.018	0.016	2.68** (0.93 – 4.23) Ref.	0.035	0.033	5.21** (2.80 – 7.62) Ref.
No	312 (61.78%)												

* P-value < .05,

** P-value < .01

B = Beta, R2 = R-squared, AR2 = Adjusted R-squared, CI = Confidence interval

quarantine had no significant association with IES and DASS subscale scores.

4. Discussion

In accordance to the response of college and university students from 9th April, 2020 (since when COVID-19 cases started to soar high after the detection of first confirmed case on 8th March, 2020 in Bangladesh) to 15th April, 2020, the study suggests that, 28.50 % students reported mild to extremely severe stress levels 33.28% students reported mild to extremely severe anxiety levels, 46.92% students reported mild to extremely severe depression levels (Fig. 1) which is lower than depression levels in adolescents (Anjum et al., 2019) and 69.31% students reported mild to severe level of psychological impact

caused by the outbreak (Fig. 2). These findings corresponds with a study conducted in China which have higher level of psychological impact compared to stress, anxiety and depression in general public at initial stage of the epidemic (Wang et al., 2020). The study suggests that university students had higher psychological impacts than college students. More than 69% of university students experience mental stress (Hossain, 2018). Also, existing literature has evidence for having increased negative emotion with higher educational attainment (Li et al., 2020). Educational activity being hampered due to this shut down can be a reason for higher stress in university students which can be solved by necessary arrangements for online classes. Uncertainty regarding academic progression can be a stressor for young minds (Roy an Tripathy, 2020).

Students in aged above 25 had higher psychological impact than

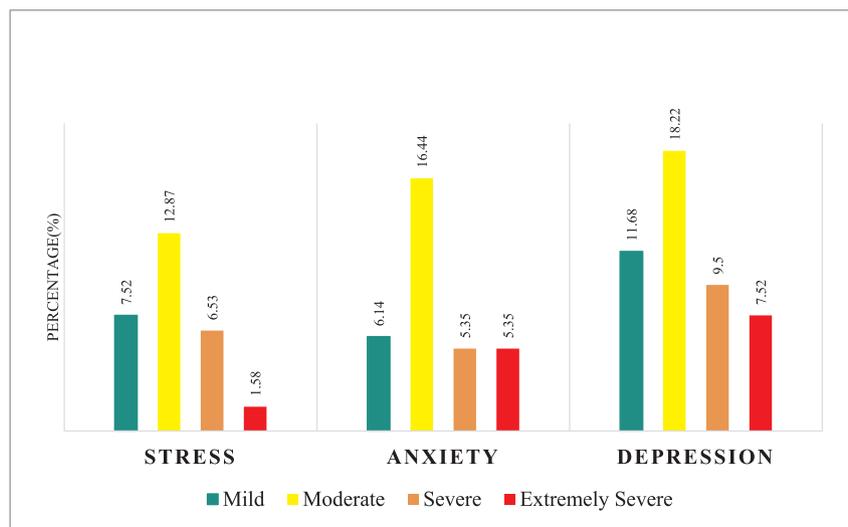


Fig. 1. Prevalence of stress, anxiety and depression related to COVID-19 among home quarantined students in Bangladesh.

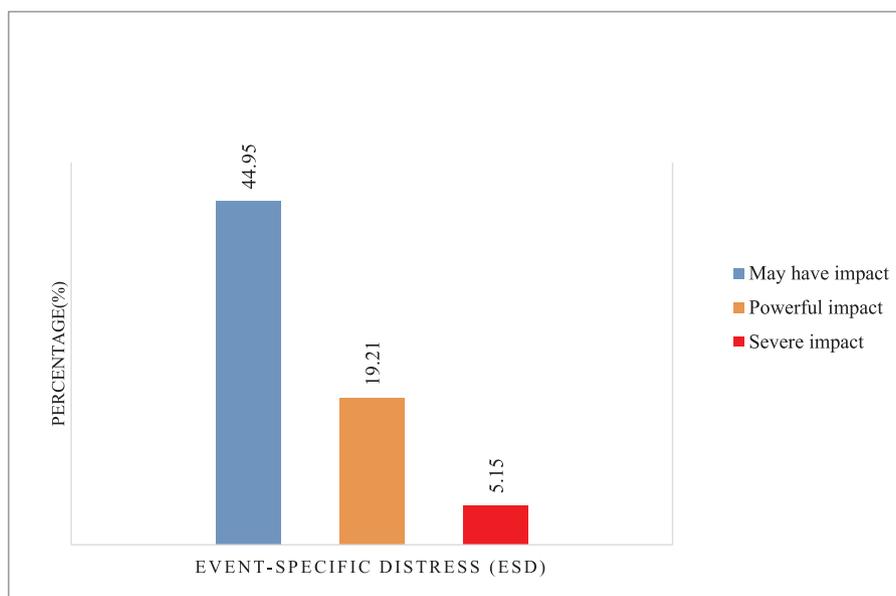


Fig. 2. Event-specific distress (associated with COVID-19) among home-quarantined students in Bangladesh.

students in age groups 20 to 24. In fact, this finding corresponds with a previous study that indicates higher IES score for older age (Zhang and Ho, 2011). This may also be the reason for university students to have higher IES score. To combat this problem concerned authority can develop web-based education system to keep academic progress ongoing (Zhang et al., 2014).

This study suggests that 24.36% students had moderate to severe ESD as the COVID-19 started to spread everywhere in Bangladesh which is approximately twice compared to hospital employees in China following the SARS outbreak in 2003 (Wu et al., 2009). Addition to that, students reported COVID-19 related social stressors such as financial uncertainty (35.64%), fear of infection (50.89%), inadequate food supply (16.24%), lack of information on COVID-19 (31.49%), excessive exposure to COVID-19 news in social and mass media (38.22%) were affecting them psychologically (Table 4). According to 67.13% respondents, prolonged quarantine was also reported to be a stressor in this outbreak situation. The study found that gender was not associated with COVID-19-related distress. This finding is inconsistent with a study conducted on general population of China suggesting males having significant associations with stress, anxiety, depression and ESD (Wang et al., 2020). 10.7% respondents of our study went through severe to extremely severe anxiety. Anxiety reflecting in a large population group may result in panic buying which will eventually lead to exhaustion of necessary daily resources (Roy and Tripathy, 2020). This may also create a scope for the market to increase prices for daily goods.

It was found in our study that 8.11% respondents reported severe to extremely severe stress which can potentially have serious psychological consequences. And, 17.02% respondents reported to have severe to extremely severe depression. It is hard to say that being in home quarantine is causing this depression as DASS 21 scale is independent of events but they need the attention of mental health specialists for certain. Moreover, the results show no significant relationship between DASS depression subscale score and prolonged duration of home-quarantine complained by the respondents.

In this study, 29.7% of students reported to have at least one symptom such as fever, dry cough, throat pain, difficulty breathing, fatigue and stuffy nose. Linear regression in the study showed that physical symptoms (e.g., fever, cough) were significantly associated with higher DASS stress subscale, DASS anxiety subscale, and sore throat was only associated with DASS depression subscale, while difficulty breathing and fatigue both were associated with higher DASS

stress, anxiety and depression subscale scores. Previous study also showed that physical symptoms can have significant impact on psychological response (Wang et al., 2020). Most importantly, our findings elucidated that 9.90% of students perceived these symptoms as they are infected with COVID-19 as these symptoms are close to COVID-19. Previous study also demonstrates the relation between perception about physical health and depression (Hossain et al., 2019). This finding suggest that medical practitioners should add psychological intervention with treatment for who have those infection related symptoms in any outbreak situation. Another finding of the study showed that students involved with various activities like physical exercise (26.73%), recreational activity (54.46%) and household chores (55.45%) have coped with situation better. These findings are consistent with the previous studies that suggests physical activity to have positive effect on mental health and stress-coping capacity (Koo and Kim, 2018).

16.24% respondents marked inadequate food supplies that showed significant association with stress, anxiety, depression and ESD (Table 4). Similarly a study showed that deprivation from basic supplies such as food, clothes etc. during quarantine period can be a source of frustration and furthermore association with anxiety even after 4 to 6 months of release (Wilken et al., 2017; Blendon et al., 2004). Another finding from our study revealed that financial uncertainty was a stressor for 35.64% participants and this factor was very significantly related with higher level of stress, anxiety and depression. The people from lower socio-economic group who work from hand to mouth to manage their livelihood tend to face more problem with financial uncertainty in a quarantine situation and the psychological effects appear to be long lasting even after the quarantine. The study suggests that half of the respondents had fear of infection that is significantly associated with anxiety and ESD. Researchers also found in a study that, about 40% of respondents were affected by the thought of contracting COVID-19 infection (Roy and Tripathy, 2020) & fear of infection was also associated with anxiety in a study indicating increasing number of patients and suspected cases as a prime factor (Bao et al., 2020). In our study, 31.49% participants reported inadequate valid information as a stress in quarantine situation which was also associated with higher ESD. Also, it was seen that information provided by IEDCR, Bangladesh had mixed reaction among country population (Siddika and Islam, 2020). That shows that people had a lack of transparency from health and government officials about the information of the pandemic. This issue highlights the need for public health officials to provide rapid, clear messages delivered to promote accurate understanding of the situation.

The study suggests that 38.22% respondents perceived social media as a stressor which was significantly associated with higher stress, depression and ESD. Previous studies provide evidence of increase of ESD by indirect exposure through mass media (Neria and Sullivan, 2011). That's why people need to stay positive in social media. Prolonged home-quarantine may have negative psychological outcome (Brooks et al., 2020) but the study showed no meaningful impact regarding this. The study determined only ESD, depression, anxiety and stress in the study population as those are believed to be the predominant reason for causing psychological distress in an outbreak situation.

Considering 92.5% of students involved in online activities in our study, concerned authorities can launch mental health literacy program including multidimensional psychological interventions such as Cognitive Behavioral Therapy (CBT), psychoeducation, self-monitoring, behavioral activation etc. via smartphone application since all educational institutions have been shut down to prevent physical engagement (Davies et al., 2014). Another reason to consider online interventions is that the young people are very much handful in smartphone application (Do et al., 2018). Modification of life style factors may improve the mental health as well (Hossain et al., 2019).

4.1. Strength and limitations of the study

Currently, there is no published research reports examining the psychological impact and response of the general public who are in home quarantine during the peak of the COVID-19 epidemic in Bangladesh. Our study provides information about the risk factors associated with psychological impacts that should be helpful for concerned authorities to plan and adopt appropriate interventions to overcome the negative psychological impacts to ensure sound mental health, especially those in quarantine. The study can further assist in future research on psychological aspects of student population.

This study has several limitations to acknowledge. First, the respondents needed to have access to internet to participate, which suggests that they had higher socioeconomic status than the overall group. This limits the generalizability of the conclusions. Second, this study is limited by its cross-sectional nature & considering the lockdown situation due to the COVID-19 outbreak, we adopted the online convenience sampling strategy which was not based on a random selection of the sample. Therefore, making causal inferences was not possible and also the possibility of sampling bias should be considered. And finally, this study relied on self-reported answers regarding experience during home-quarantine stay which may not align with clinical diagnosis of a mental health professional.

5. Conclusion

The study findings indicate a substantial portion of population are at high risk of psychological consequences during COVID-19 outbreak. People those are home-quarantined following lockdown measures for preserving their physical health, requires paying attention to their mental health as well. As the study suggests higher level of psychological impact, it is important to improve the delivery of psychological intervention, specially community-based, keeping up with the clinical field of the health system. Furthermore, the perception of the population regarding the outbreak plays an important role on mental health. This outlines the importance of having the sufficient information and sound knowledge about the outbreak. However, being involved in healthy activities such as physical exercise can improve the ability to cope with this drastic situation.

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Ethics and consent to participate

Ethical standards were maintained to the highest possible extent whilst the study was conducted. All participants read, understood a consent form and agreed to participate in the study. Furthermore, this research is supported by the Department of Public Health and Informatics, Jahangirnagar University, Bangladesh.

Declaration of Competing Interest

The authors declare that they have no conflict of interest.

CRediT authorship contribution statement

Abid Hasan Khan: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing - original draft, Writing - review & editing, Validation. **Mst. Sadia Sultana:** Investigation, Data curation, Writing - original draft, Validation. **Sahadat Hossain:** Conceptualization, Supervision, Writing - review & editing, Validation. **M. Tasdik Hasan:** Writing - review & editing, Validation. **Helal Uddin Ahmed:** Writing - review & editing, Validation. **Md. Tajuddin Sikder:** Writing - review & editing, Validation.

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